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ABSTRACT

This instructional handbook is one of a series of ten packets designed to form a comprehensive course in nutrition for secondary students. This booklet examines some of the more common myths associated with sport nutrition and provides basic guidelines for sound dietary habits for both athletes and nonathletes. It contains a page of teaching suggestions, a pre-test for the students, and factual nutrition information with examples of how this information can be used in daily living. A post-test and bibliography are included. (JD)

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NEW HORIZONS IN NUTRITION

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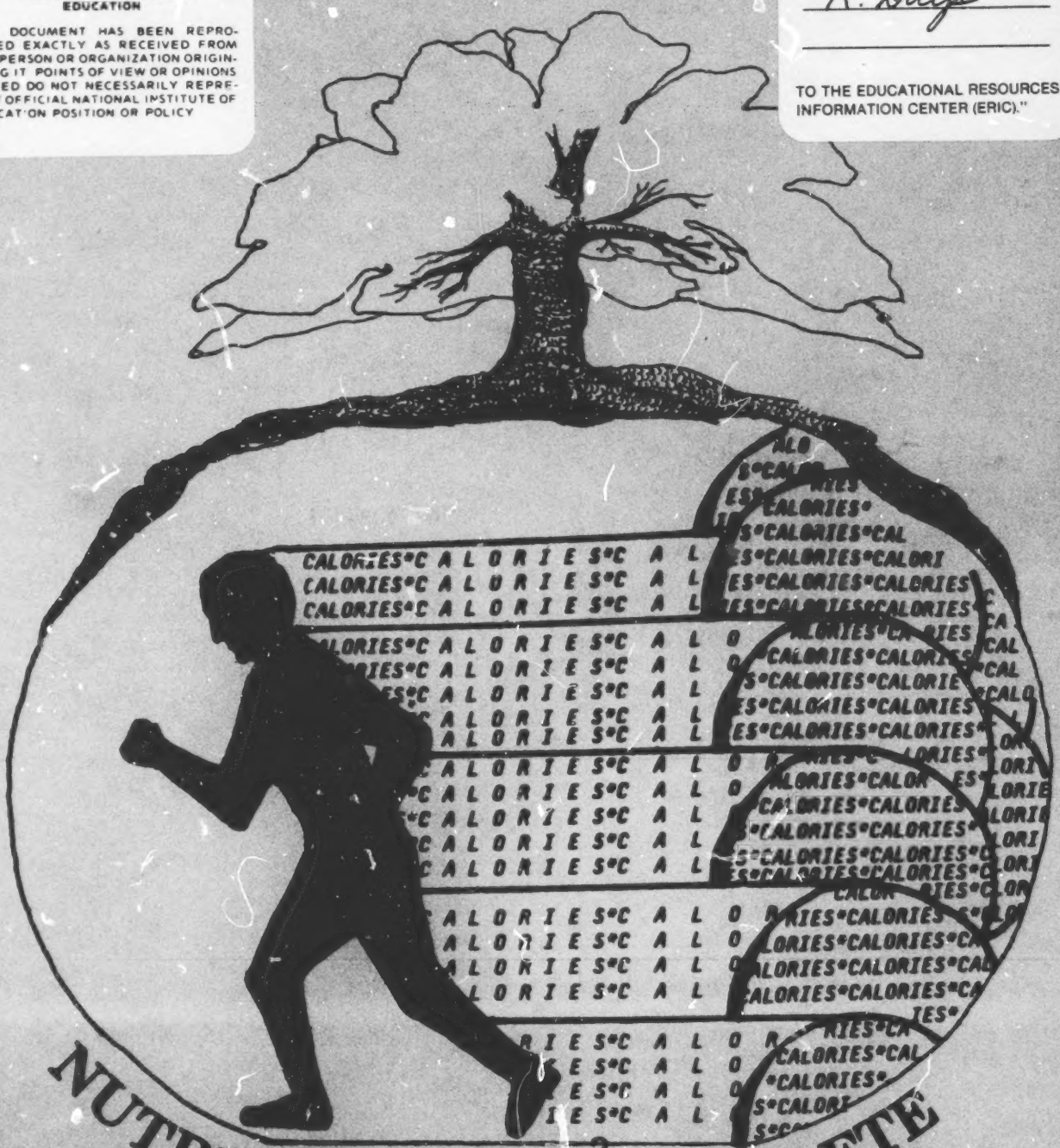

NUTRITION and the ATHLETE

SP 016 756

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NEW HORIZONS IN NUTRITION

AN ISSUE ORIENTED APPROACH

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PROGRAM INTRODUCTION

These ten instructional packets are designed to help you make the science of nutrition a fascinating, relevant topic of study for your students. The study of nutrition is the most basic of all skills as eating is something done by every student every day of his or her life. With the intrinsic relationship between proper nutrition and good health, it is vitally important that we help students to make intelligent decisions with regard to what they eat.

The ten packets which make up New Horizons in Nutrition can be taken together to form a comprehensive course in nutrition for secondary students. If you prefer, individual packets can be used when they're relevant to specific topics in health, home economics, science, or social studies classes. In addition, you can use the materials with entire classes or individual students can be given the packets for self-directed study.

Each packet contains a page of teaching suggestions which can easily be detached before the rest of the booklet is given to the students. The materials for the students include a pre-test, a selection which provides the students with factual information and examples of how this information can be utilized in everyday life, and a post test. Reading the selections and completing the evaluation devices is not enough to insure mastery of the concepts. We urge you to reinforce the packets by following through with related classroom activities. You'll find suggestions in the "Notes to the Teacher" or use them as a springboard to develop activities more ideally suited to the needs of your students. Finally, brief bibliographies are provided with each packet which lists related readings and audiovisual materials.

These suggested materials are not meant to be used as a research bibliography. Rather, they are sources of additional information which are likely to be of interest to secondary students.

The topics of the ten packets are:

1. *Advertising*
2. *Back to Basics*
3. *The Emotional Aspects of Nutrition*
4. *Food Faddism*
5. *Low Carbohydrate Diets*
6. *Nutrition and the Athlete*
7. *Nutrition: Yesterday, Today, and Tommorrow*
8. *Social Issues in Nutrition*
9. *Vegetarianism*
10. *Vitamin C and the Common Cold*

We sincerely hope these packets help you to make nutrition education an alive, relevant, and exciting topic of study for you and your students. The benefits for everyone are well worth your effort.

The Authors

TEACHING NOTES

INTRODUCTION

High school athletes are very susceptible to nutritional misinformation disseminated through the media and some coaches. This packet examines some of the more common myths associated with sports nutrition and it provides basic guidelines for sound dietary habits for both athletes and non athletes.

OBJECTIVES

1. Students will identify the basic components of a balanced diet for athletes.
2. Students will recognize the myths associated with commonly prescribed dietary practices for athletes.
3. Students will list three functions of water in the diet.

ACTIVITIES

1. Collect a few articles from popular magizines in which famous athletes describe their diets or in which a specific diet is suggested for athletes. Critique the articles.
2. Do the same as No. 1 except use ads for supplements commonly sold to athletes, i. e., protein supplements, vitamin/ mineral pills, etc.
3. Invite coaches from various sports to visit the class to discuss the nutrition advice they give to athletes on their team.
4. Invite the school nurse, team physician, or a local nutritionist to discuss safe weight loss programs.
5. Visit the school cafeteria and point out how the typical Type A school lunch provides important nutrients needed by athletes and non-athletes.

PRE TEST KEY

1. F
2. T
3. F
4. F
5. T
6. T
7. F
8. T
9. F
10. T

POST TEST KEY

1. T
2. T
3. F
4. T
5. F
6. T
7. T
8. Damage to heart
9. High fat content is dangerous
10. Weight gain (Alternate answer: During low carbohydrate phase, protein in the muscles may be broken down for energy)

TEACHING NOTES CONT'D

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PRE TEST

1. _____ Athletes require extra protein for muscle development.

2. _____ Vitamins do not supply energy in the diet.

3. _____ Glycogen loading has proven to be effective in improving performance in most sports.

4. _____ Almost every athlete should take a vitamin/mineral supplement on a daily basis.

5. _____ It is permissible for an athlete to drink water during practice sessions.

6. _____ Salt tablets are rarely necessary for athletes.

7. _____ Calories are fatty substances found in food.

8 _____ Muscle tissue weighs more than fat tissue.

9. _____ A pure liquid diet is a safe way for a wrestler to lose weight.

10._____ Consuming a food high in sugar immediately before a sports event is not likely to improve performance.

NUTRITION AND THE ATHLETE

INTRODUCTION

Athletes need more protein! How many times have you heard that statement? If you are an athlete, perhaps you have been told this many times. Do athletes really need more protein than their less active counterparts? What about all these fad diets proposed for the athlete? Are they valid?

There are as many different diets as there are coaches. Each coach recommends what he thinks is the ideal diet for the boys and girls who play the sport. Many claim that each sport requires a special diet. Have you ever observed swimmers sucking on honey bottles before their race, or inhaling gelatin and vitamins between workouts? Possibly you have seen weight lifters downing their protein supplements to help build those muscles. Maybe you have watched football players devouring the big steaks before the game. Or are you a wrestler existing on liquids before a match so you can weigh in at that magic number?

The list goes on and unfortunately too many athletes follow the fad diets. Are these diets valid? Do they really improve performance? A quick look at the nutritional needs of an athlete will clear up some of this confusion.

NUTRITIONAL NEEDS

A search of the literature dealing with nutrition and athletes clearly defines two points.

1. Basic nutrition needs of athletes during training do not vary for different sports.
2. Basic nutrition needs of athletes do not vary from the basic nutrition needs of sedentary individuals, except in quantity.

Thus, everyone of us requires the same nutrients every day. It matters little whether we are a boy or a girl, man or woman, sedentary or active, engaged in baseball, football, basketball, tennis, racket ball, etc. All of us need the same six groups of nutrients, except for minor changes in the quantities which are discussed later in this packet.

Each of these nutrients is important and each performs a special function. If one nutrient is omitted from the diet, not only is the function of that one interfered with but the whole nutritional balance may be upset. This can cause a decline in the performance of an individual. The six groups of necessary nutrients are: water, fat, carbohydrate, protein, vitamins and minerals.

WATER

Water is the most mobile, the most frequently depleted and the easiest to restore of all of the nutrients. We lose water rapidly in hot weather and during heavy exercise, so we should replace it at a frequent interval. Water has many functions to perform: it helps control the body temperature; it is necessary for the proper functioning of enzymes, digestion and metabolism; it aids in the elimination of waste products from the body; and it helps to transport the nutrients to the muscles for utilization.

If we were to lose more than 2 to 3% of the body's water, then our performance declines. Dehydration due to heat injury, may be fatal. This occurs most frequently during late summer or early fall. One way to prevent this is to serve water in adequate amounts before, during and after a practice or a competition.

FAT AND CARBOHYDRATES

The storage of fat in the body is almost inexhaustible, and fat is the fuel most frequently used by the body to power the muscles. On the conditioned athlete up to 60 or 70% of aerobic exercise (aerobic exercise is exercise that requires oxygen), can be fueled by fat. If the exercise becomes anaerobic or exceeds 70% (anaerobic exercise is exercise that is performed without oxygen), then the body turns to carbohydrate for fuel. If anaerobic exercise continues, carbohydrates become the complete source of fuel. The reason for this is simple. Fats require more oxygen for utilization than carbohydrates. When exercise is strenuous, the muscles demand so much energy that the oxygen supply cannot meet the demand. Thus, carbohydrates become the main fuel for exercise because it is used inversely with the oxygen supply.

Carbohydrate which is stored in the body and mobilized for use as needed is called ***glycogen.*** It is stored in the liver (110 gm), in the muscles (250 gm) and in the blood (15 gm). There are approximately 385 grams of glycogen in the body. Just how far one can go on a gram of carbohydrate depends on the rate of energy expenditure (the Glycogen Loading Diet will be discussed further on in this packet).

PROTEIN

Protein is the misunderstood nutrient. It is the least important nutrient for energy expenditure. Protein is used to power muscles only in starvation. But, it is a very important nutrient. It has many other functions to perform. It is needed daily to build and repair the tissues of the body. This building

and repairing goes on constantly. It is needed for hormones, enzymes, and for the production of antibodies. Protein is necessary for the brain, and this plays a role in athletic performance.

Our protein requirement is not affected by our athletic ability. Approximately 15% of the kilocalories we consume daily should come from protein. Or another way to figure the amount of protein is to allow .8 gram of protein per kilogram of ideal body weight or .4 gram protein per pound of ideal body weight. This runs counter to the age-old misconception that athletes require more protein to build muscles.

Remember that some of the protein must be complete or high quality protein. Meat, fish, eggs, cheese, poultry and milk contain all of the eight essential amino acids needed to build and repair tissue. These foods contain ***complete proteins*** and these proteins are sometimes referred to as being of ***high biologic value.*** The vegetarian would have to supply complimentary plant proteins to make a complete protein, or use an animal protein with the vegetable protein.

Studies comparing the physical performance on different quantities of protein intake confirm that there is no improved performance on a high protein diet (160 gm/day) nor decreased performance on a low protein diet (50 - 55 gm/day). High protein diets do have problems. They may lead to ketosis and dehydration. The kidneys and liver have to work hard to metabolize protein and eliminate the waste products. This can lead to frequent urination and thus dehydration.

Also, a high protein diet is associated with an increase in fat. Too much fat can be detrimental to health. High protein diets may also deprive the athlete of a more efficient fuel - carbohydrate.

VITAMINS AND MINERALS

Vitamins and minerals are regarded as the non-fuel nutrients. They help to regulate energy expenditure, but do not supply any energy by themselves. There is no evidence to suggest that vitamin supplements improve the performance of an athlete who consumes a properly balanced diet. However, vitamin deficiencies may decrease performance.

Many vitamins, such as vitamins A and D, have toxic effects when taken in excess. Recent studies indicate that E may also be toxic to some individuals. Supplements of A, D and E may be injurious to health and are totally unnecessary if the athlete is receiving a proper balanced diet.

Supplements of vitamin C have been encouraged by some coaches to prevent colds and to encourage collagen synthesis. This is unnecessary if a balanced diet is consumed. Vitamin C is potentially harmful-

it may cause kidney stones and produce a B_{12} deficiency. The use of vitamin B supplements for athletes is not supported by any studies.

There is a story told among medical men from other countries who attend the Olympics: "How does one identify an American athlete in international competition? Easy. He's got the richest urine in the world. It is full of vitamins."

Do athletes have an increased need for iron? This suggestion is based on the phenomenon of "athlete's anemia", a borderline low level of hemoglobin found in many well-trained endurance type athletes. This has been explained by two factors: 1) The most common cause of anemia is iron deficiency and 2) Athletes are known to lose small quantities of iron in perspiration and occasionally in urine. The amount of iron lost by these two routes in not significant enough to create an iron deficiency.

One argument against iron intake deficiency as the cause of "athlete's anemia" is the frequent unresponsiveness of the hemoglobin level to iron supplements. One explanation of "athlete's anemia" is that the borderline low hemoglobin level found in endurance athletes is a physiologic adaptation to training. The low hemoglobin level prevents the sludging of red blood cells during exercise. Women may have to take a multivitamin with iron supplement to ensure adequate intake. Otherwise, iron supplements are not recommended. They may cause nausea, gastric upset, constipation and an accumulation of iron in tissues of those genetically predisposed.

MINERALS AND ELECTROLYTE BALANCE

Athletes in training do not require electrolyte supplements to replace perspiration losses because healthy kidneys automatically compensate by conserving sodium (Na) and potassium (K). Also, the ingestion of food and fluid with the addition of salt, has been shown to sufficiently replenish the electrolytes lost in perspiration, except in very heavy exercise in very hot weather over a period of several days.

The need for potassium supplements has been suggested because of the low serum levels of this mineral in some athletes after exercise. But this level is now thought to be due to hemodilution rather than actual depletion of body potassium. During heavy exercise in hot weather, an extra banana, apricot, or baked potato (including skin) is enough to make up the possible deficiency.

Salt tablets are to be avoided. They drain water from the tissues to the intestinal tract and often produce nausea. Frequently insufficient fluids are consumed along with the salt tablets and this may lead to dehydration.

CALORIES AND ENERGY

The quantity of the ideal training diet is determined by the need to: 1) Maintain an efficient body weight and 2) Meet the increased energy requirements of training. Efficiency requires that excess calories be limited to prevent storage as fat, becoming more weight to carry around.

One practical way to assess the percentage of body fat is to measure the thickness of a fold of skin with calipers (the calipers is a special device for this purpose). This is more accurate than comparing the athlete's weight to a standard weight chart for his or her height and age. The weight chart may give a false impression of overweight because the athlete contains more muscle tissue than fat tissue, and muscle weighs more than fat. Women in general have a larger body fat content than men.

Some sports require leanness. This is particularly important in endurance sports. On the other hand, a certain amount of extra weight may improve stability and balance. A good example of this is weight lifting. Extra fat may also be tolerated in swimming.

How much does the daily caloric requirement increase with exercise? The amount depends upon the type of sport. The average daily caloric intake during training increases by approximately 500 to 1500 kilocalories. A short distance runner would not need as much as one who runs a marathon. Nor would a horseman require as many calories as a swimmer.

The best way to estimate caloric requirements is to measure the energy expended as indicated by the increased amount of oxygen consumed during exercise and recovery. Oxygen consumption will vary with individuals and with different sports. Oxygen consumption increases as the number of muscle contractions increase. (See chart below.)

An athlete in training may increase his or her intake by as much as 1500 kilocalories, depending on the sport, the muscles used, etc. But even those individuals have to watch their weight. Remember calorie intake should match calorie expenditure.

TABLE II

CALORIC COST OF EXERCISE PER DAY

Short burst maximal effort or 1 min. effort	1 - 10 min. sustained effort	1-min. or more intense repeated effort	Endurance
Shotput	Run-880 yd., 2 mile	Football	Run-6 mile
Javelin	Swim-100 yd.	Basketball	Soccer
High Jump	Wrestling	Ice Hockey	Cross-Country skiing
Dashes, hurdles Swim-100 yd.	Gymnastics	Lacrosse	
KCal/day:			
3,400	3-5,000	4-5,000	3-6,000

*Nutrition Today Society. "IS MORE BETTER?" Nutrition Today. Vol. 14, No. 6, November/ December, 1979.

GLYCOGEN LOADING DIET

This diet was described by Ostrand in 1967 and involves the following procedure:

1. One week prior to the event, exercise to exhaustion, which depletes muscle glycogen storage.

2. For the next three days, maintain low glycogen levels by consuming a low carbohydrate, high protein and fat diet; and

3. Three days prior to the event, eat a high carbohydrate diet.

This diet has not been shown to significantly improve endurance during competition as compared to a simple high carbohydrate diet. It may be an unnecessary burden to many athletes. More glycogen does not necessarily mean better performance. An increase in glycogen storage levels does not increase speed. Also, an athlete, who is not well trained, is more likely to have his endurance limited by glycogen since he will consume glycogen at a higher rate.

There are many problems associated with this diet:

1. ***It may damage the heart.*** Glycogen is deposited in the heart and this may affect the efficiency of the heart.
2. The high fat and protein part of the diet would be contraindicated for individuals with cardiovascular disease.
3. ***There is weight gain with increased glycogen storage.*** Each gram of glycogen is stored with 2.8 gm of water.
4. During the low carbohydrate phase of the diet, the body may use the protein in the muscle for energy; and
5. The effect of this diet on the metabolism of fatty acids is unknown.

SUMMARY

There is no single best food for athletes. The increased calories required for training should be supplied by increasing portions of all foods found in a balanced diet, rather than by a single best food.

The increase in quantity should maintain the proportions recommended by the National Academy of Science for all Americans and endorsed by sports nutritionists as proper for athletes. The recommended diet contains 15% of kilocalories derived from protein, 30 to 35% from fat, and 50 to 55% from carbohydrates. These recommendations take into account:

1. The body's structural requirements.
2. The relative efficiency of various foods to serve as fuel.
3. The complex interaction of food during digestion.
4. Current knowledge concerning the prevention of disease.

If a balanced diet is maintained, supplements are not necessary and, in fact, may be dangerous to our health. They may also have the effect of decreasing performance.

Coffee and tea should be avoided in the pre-game meal because of the ***diuretic effect*** (increase of urine output). Gas producing foods may cause gastric discomfort and should be avoided. Alcohol can impair coordination and performance. It is now unnecessary to avoid roughage prior to competition as

has been suggested in the past.

With the proper knowledge of nutrition, performance will increase and endurance will improve. Then sports will truly produce "the sound body".

CASE STUDY

Sean is eagerly looking forward to the beginning of his sophomore year. Ever since he had been a small boy, he had dreamed of being a star on the football team. Soon he would have a chance to try out for the varsity.

Sean has always tended to be a little smaller than other boys his age, and he fears this will be a hinderance during tryouts. During the three months preceeding the start of summer practice, Sean decided to try a crash course approach to body building. Each day he planned a lengthy session of working with weights to enhance muscle development and two sessions a day of running to build endurance.

To go along with the physical fitness plan he designed, Sean also decided to make some changes in his diet. Sean had two main objectives: to increase his overall body weight and to increase his strength through muscle development. Therefore, he felt it would be best to concentrate on a high protein diet and to use liquid protein supplements for extra calories. As much as possible, Sean wanted to avoid foods which were high in sugar. A typical daily meun for Sean is as follows:

Breakfast
3 eggs
4 strips of bacon
1 glass of milk

Lunch
3 Hamburg patties
3 oz. of cheese
2 glasses of milk

Dinner
6-8 oz. Steak
Salad with dressing
2 glasses of milk

Snack
2-3 8 oz. glasses of liquid protein supplements

QUESTIONS

1. Considering Sean's typical daily menu, it is obviously high in protein. What other specific nutrient is very high in Sean's diet? Explain what are the dangers associated with a high intake of that nutrient.

2. Discuss whether or not Sean's premise is valid that a high protein diet will increase muscle development.

3. By avoiding sugars and starches in his diet, what essential nutrient is Sean eliminating from his diet? Discuss the dangers of eliminating that nutrient from his diet.

4. What are the major sources of energy in Sean's diet? Discuss the efficiency of those energy sources.

5. What suggestions might you give Sean to improve his overall diet?

POST TEST

1. _____ It is possible to experience toxic effects from the consumption of too much vitamin A, D and E.

2. _____ Nutritional requirements for athletes and non-athletes are identical except for caloric intake.

3. _____ Drinking coffee or tea before an athletic event is advisable because of the stimulant effect.

4. _____ Glycogen is the form in which the muscles and liver store carbohydrate.

5. _____ The drinking of fluids duringpractice sessions should be avoided because they can cause an upset stomach.

6. _____ It is possible to meet the nutritional needs of athletes through commonly available foods.

7. _____ Protein is not an efficient source of energy.

List three hazards associated with the practice of glycogen loading.

8.

9.

10.